



# **IntesisBox<sup>®</sup> Modbus Server**

KNX TP-1 (EIB)

User's Manual

v10 r12 eng

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Intesis Software S.L.  
Milà i Fontanals, 1 bis - 1<sup>º</sup>  
08700 Igualada  
Spain

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Gateway for integration of KNX TP-1 (EIB) systems into Modbus (RTU and TCP) control systems (i.e. SCADA, BMS, PLC...).

Three models are available for this gateway, with the following **Order Codes**:

- **IBOX-MBS-KNX-100.** Tiny model supporting up to 100 points.
- **IBOX-MBS-KNX-A.** Basic model supporting up to 500 points.
- **IBOX-MBS-KNX-B.** Extended model supporting up to 3000 points.

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## 1. Description

### 1.1 Introduction

*IntesisBox<sup>®</sup> Modbus Server - KNX* is a communication gateway for KNX TP-1 (EIB) systems to ModBus slave (RTU and TCP).

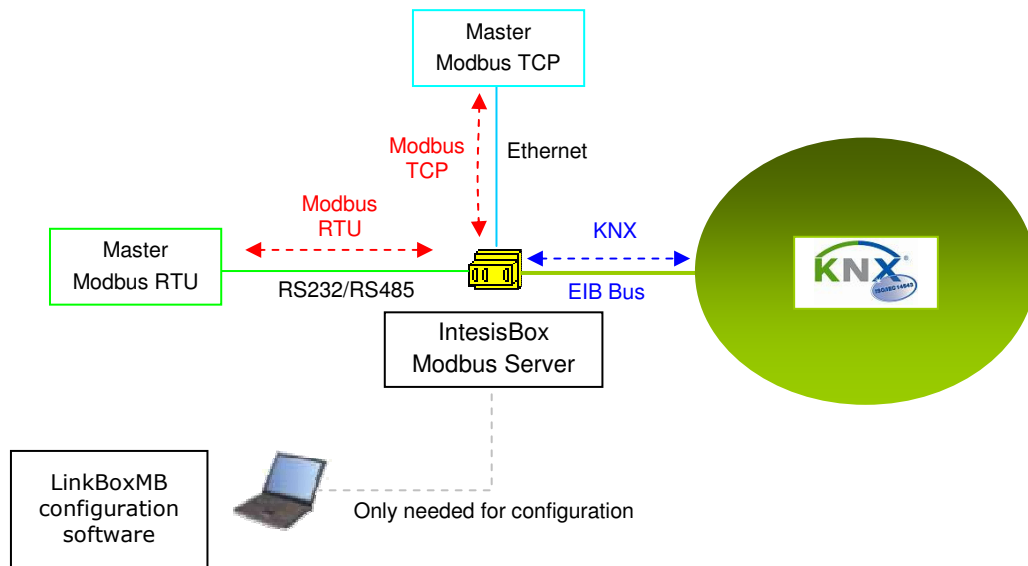
This gateway allows to integrate KNX equipment inside a supervision/control/automation system through PLC, SCADA, and in general through any device or system with Modbus master (TCP or RTU) interface.

The aim of this integration is to make accessible KNX system signals and resources from a Modbus master device or system, as if it was a part of the own Modbus system and vice-versa. For this, *IntesisBox Modbus Server - KNX* acts as a Modbus slave device in its Modbus interface, allowing a Modbus master device to read and write its internal points. And from the KNX system point of view, the gateway simulates a KNX device and acts as if it was *one more device* into the KNX system.

## 1.2 Functionality

Every one of the defined signals into the IntesisBox is associated to a Modbus address, with this, all the system is seen as a single Modbus slave unit from the Modbus system point of view.

From the KNX system point of view, every signal in IntesisBox has an associated group address (the sending group address) and also it can have one or more listening addresses.



### Integration of KNX and Modbus using *IntesisBox Modbus Server - KNX gateway*

The integration operation is as follow:

From the KNX system point of view, in the start up process of the gateway and also after a detection of an EIB bus reset, the gateway polls the KNX signals configured to be updated in this situation and maintain the received values in memory to be served to the Modbus system when requested. Also listen for any KNX telegram related to the internal points configured in it and acts accordingly to the configuration of the related point.

From the Modbus system point of view, after the start up process, the gateway listen for any read or write request, and serves any read request or performs any writing request of its internal points received from Modbus system. The values received from Modbus become available to be read by the KNX system and vice-versa.

If a signal has been configured as of type "T" Transmit (in the KNX part), any new value for the signal coming from the Modbus system is notified to the KNX system with the corresponding telegram.

When, from the KNX system, a signal is changed (written from any other KNX device for example), the new value is updated in the gateway's memory, ready to be served to Modbus when requested.

Also the following functionality is supported by the gateway:

For every point, in the KNX part, one main group address (the sending group address) and different listening group addresses can be defined. With this, from KNX, every point can be addressed not only using its main group address but also using the other defined listening addresses for the point.

Any change in a gateway's point with the feature "T" activated (in the KNX part), will force the transmission of this point value with the corresponding telegram to the KNX system.

When the gateway starts up, or after an EIB bus reset, all the points with the feature "U" or "U2" activated (in the KNX part) will be forced to be read in the KNX system to update its values in the gateway's internal memory.

Any point with the feature "W" activated (in the KNX part), can be written in any moment from the KNX system.

Any point with the feature "R" activated (in the KNX part), can be read in any moment from the KNX system.

All the mentioned features (W,R,T,U) related to the KNX part are configurable per every point in the gateway, with only a few necessary restrictions (see below in this document).

KNX-EIB EIS (data types) supported are: switching (1 bit), dimming (4 bit), float (16 bit), scaling (8 bit), drive control (1 bit), priority (2 bit), float IEEE (32 bit), counter (8 bit), counter (16 bit), counter (32 bit), ASCII char (8 bit).

### 1.3 Capacity

Element	Max. (Tiny version)	Max. (Basic version)	Max. (Extended version)	Notes
KNX (EIB) groups	100	500	3000	Maximum number of different EIB group addresses that can be defined.
KNX (EIB) listening addresses	1000	1000	1000	Maximum number of different EIB group addresses that can be defined as listening addresses, one or more of these listening addresses can be assigned to every point. With this, more than one EIB group address of the KNX system can actuate on the same IntesisBox's point.

There are three different models of *IntesisBox® Modbus server - KNX* with different capacity every one of them, the following:

- Tiny model supporting up to 100 points. Order code: IBOX-MBS-KNX-100
- Basic model supporting up to 500 points. Order code: IBOX-MBS-KNX-A
- Extended model supporting up to 3000 points. Order code: IBOX-MBS-KNX-B



## 2. Modbus interface of IntesisBox

### 2.1 Description

IntesisBox acts as a slave device in its modbus interface, this interface can be the Ethernet port (if using Modbus TCP), or the RS232 port or the RS485 port (if using Modbus RTU). To access the points and resources of the IntesisBox from a modbus master device, you must specify as the modbus register addresses, those configured inside IntesisBox corresponding to KNX signals. See details below in this document.

It can only be one Modbus mode active simultaneously in IntesisBox<sup>®</sup>, ModBus RTU or ModBus TCP.

### 2.2 Functions supported

This part is common for ModBus RTU and TCP.

ModBus functions 03 and 04 (*read holding registers* and *read input registers*) can be used to read Modbus registers.

ModBus functions 06 and 16 (*Single Multiple Holding Registers* and *Write Multiple Holding Registers*) can be used to write Modbus registers.

If *poll records* are used to read or write more than one register, it is necessary that the range of addresses requested contains valid addresses, if not the corresponding ModBus error code will be returned.

All the registers are of 2 bytes, even if they are associated to signals of type bit in the external system, and its content is expressed in MSB..LSB.

ModBus error codes are fully supported, they will be sent whenever a non valid modbus action or address is required.

### 2.3 ModBus RTU

Baud rate can be selected from 1200, 2400, 4800, 9600, 19200, 38400 and 56700.

Data Bits:8

Parity can be selected from: none, even, odd.

Stop Bits:1.

ModBus slave number can be configured. Physical connection (RS232 or RS485) can also be selected.

Only the lines RX, TX and GND of the RS232 connector are used (TX/RX+ and TX/RX- for RS485).

### 2.4 ModBus TCP

The TCP port to use can be configured (by default 502 is used).

The IP address, subnet mask and default router address to use by IntesisBox® can be also configured.

## 2.5 Address Map

The Modbus address map is fully configurable, any point in the IntesisBox can be freely configured with the desired Modbus register address.

## 2.6 Points definition

Every point defined in the gateway has the following Modbus features associated to it, that can be configured (optionally or mandatory depending on the feature):

Feature	Description
<b>Format</b> (Data coding) *	Data type to encode the signal's value. It will depend on the KNX type of signal associated to it in every case. Possible values are: 16 bits unsigned, 16 bits signed, 16 bits signed * 10, 32 bits unsigned, 32 bits signed, 32 bits float.
<b>Point</b> *	Is the Modbus register address for the point.
<b>R/W</b> *	Type of signal. Always from the Modbus system point of view. Possible values are: R (read only signal), R/W (read/write signal).

\* Configuration for this feature is mandatory.

## 3. KNX TP-1 (EIB) interface

This section describes the KNX part of the gateway's configuration and functionality. This section assumes the user is familiar with KNX technology and technical terms.

### 3.1 Description

The gateway connects directly to the EIB bus (KNX TP-1) thanks to its internal EIB bus coupling unit, and acts as one more device of the KNX system with the same behaviour and configuration characteristics, except that the KNX configuration of the device is not performed using KNX ETS software but using LinkBoxMB software, like all the rest of the IntesisBox Modbus Server series gateways.

Internally, the bus coupling circuitry is opto-isolated from the rest of the electronics of the device to prevent damage of all the system in case of electrical pulse or over-voltage coming from the EIB bus.

The gateway manages all the communication with the EIB bus according to its configuration.

On receiving messages from KNX, if they are destined to the EIB groups associated to internal points, the gateway updates its point's values in memory, ready to be served to Modbus when requested.

When a change in a configured Modbus point is detected, the corresponding telegram will be sent to associated EIB group of the KNX system (only if the point is configured to do so, this means if the point is configured as "T" - Transmit).

The device continuously checks the status of the KNX TP-1 (EIB) bus, if a bus loss is detected, due to a bus power failure for example, on restoration of the EIB bus the gateway will re-transmit the status of all the groups configured as "T" (transmit) and also will perform the *Updates* for the groups configured as "U" or "U2".

### 3.2 Points definition

Every point defined in the gateway has the following KNX(EIB) features associated to it, that can be configured (optionally or mandatory depending on the feature):

Feature	Description
<b>Description</b>	Signal or point description. Only for information purposes at user level.
<b>EIS</b> (DataPoint) *	KNX data type to encode the signal's value. It will depend on the Modbus type of signal associated to it in every case.
<b>Group</b> *	Is the EIB group address associated to the signal. It is also the EIB group to which will be applied the reading(R), writing(W), transmit(T) and update(U or U2) features. Is the EIB sending group or main group.
<b>Listening addresses</b>	These are the EIB group addresses that will also actuate on the signal, apart of the main EIB group address mentioned above.
<b>R</b>	Read. If this flag is activated means that this EIB group can be read from KNX system.
<b>W</b>	Write. If this flag is activated means that this EIB group can be written from KNX system.
<b>T</b>	Transmit. If this flag is activated means that when the value of this signal changes in the gateway, a message will be sent to the KNX system indicating the new value for this EIB group.
<b>U or U2</b>	Update. If flag "U" is activated means that when the gateway starts up or after an EIB bus reset, a KNX read will be performed (of the main EIB group), then the received value will update the signal's value in the gateway's memory as it would happen for a normal write of this EIB group from KNX. If flag "U2" is activated means that when the gateway starts up or after an EIB bus reset, a KNX read will be performed (of the first EIB group listening address defined), then the received value will update the signal's value in the gateway's memory as it would happen for a normal write of this EIB group (the first listening address defined) from KNX.
<b>Active</b> *	If activated means that the signal is active for the gateway, if not activated is like signal not defined. It allows you to deactivate signals without the need of delete them (useful for future use of this signals).

\* Configuration for this feature is mandatory.

All the mentioned flags (R,W,T,U,U2) related to the KNX part are configurable for every point in the gateway, with some necessary restrictions (see below in this document).

## 4. LinkBoxMB. Configuration & monitoring tool for IntesisBox Modbus Server series

### 4.1 Introduction

LinkBoxMB is a Windows™ compatible software developed specifically to monitor and configure IntesisBox-Modbus Server series. It is possible to configure all external protocols available for IntesisBox-Modbus Server and to maintain different customer's configurations based on a LinkBoxMB project for every different installation. Maintaining always on hard disk a copy of the last configuration files for every external protocol and customer, that is to say for every project.

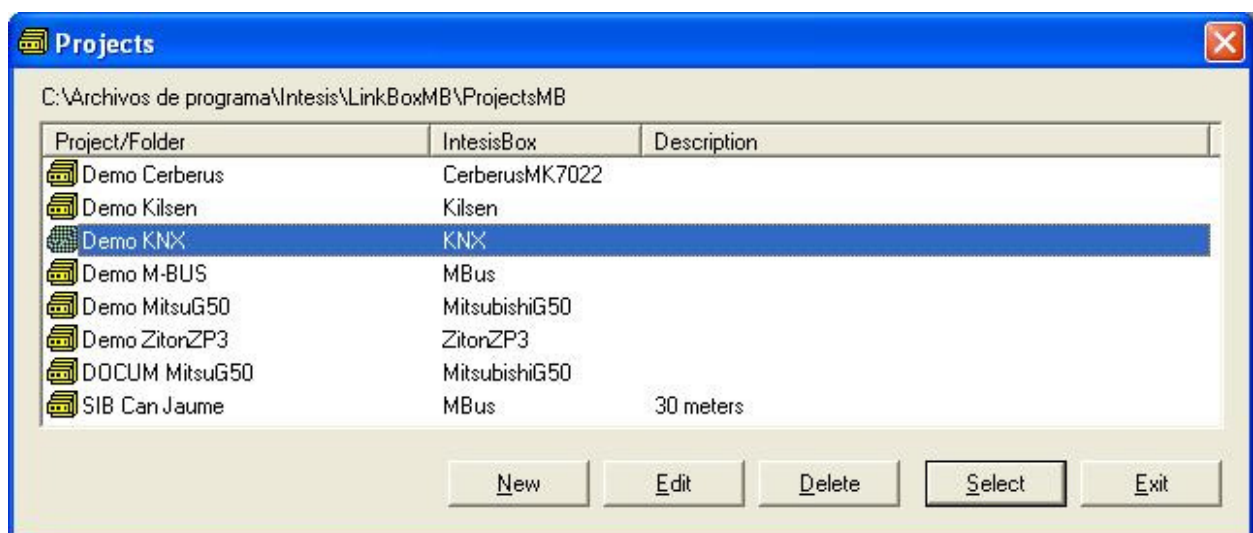
From LinkBoxMB, as well as configure the integration signals list and connection parameters for every external protocol, it is permitted to select the serial port to use to connect to IntesisBox-Modbus Server and the use of some tools for monitoring and debugging the device. Some of these tools will be explained in this document but only some of them, the rest of available debugging tools and commands will not be explained here because they are for exclusive use under the recommendations of Intesis Software technical support.

LinkBoxMB allows configuring all IntesisBox-Modbus Server series independently of the external system used. For every external system, LinkBoxMB has a specific configuration window. Periodically, new free versions of LinkBoxMB are released incorporating the latest developed integrations for external systems.

## 4.2 Project definition

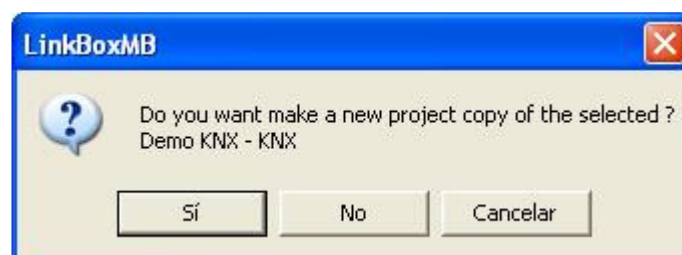
The first step to do in LinkBoxMB for a new installation is to create the installation's project giving a descriptive name to it. When you create a project, a new folder is created with the name of the project containing the configuration files needed depending on the external protocol selected for the project. It is strongly recommended that you create a new project for every installation, if not, overwriting of configuration files of previous installations using the same external protocol may occur, losing the configuration data for those previous installations. The projects folder is located in AppFolder\ProjectsMB, where AppFolder is the installation folder of LinkBoxMB (by default C:\Program Files\Intesis\LinkBoxMB). Inside the projects folder, a new folder will be created for every project defined in LinkBoxMB with the files needed for the project.

When you open LinkBoxMB, the project selection window will appear inviting you to select a project or create a new one. A demo project for every external protocol supported is provided with the standard installation of LinkBoxMB. You can create a new project or select a demo project based on the external protocol desired, and create a new one from the demo one selected.



**Project selection window**

To create a new project, select a project using the same external protocol you want to use in the new project and click on **New** button. You will be prompted to create a copy of the selected project (useful for similar installations) or create a new one.



If you select *Yes* you will be prompted to specify a name and a description for the new project that will be based on the same external protocol than the selected one. If you select *No* you can specify a name, a description and an external protocol to use from the list of available external protocols.



On *Accept*, a new folder will be created inside the projects folder with the name given to the project, this folder will contain the template configuration files if the project is a brand new one, or a copy of the configuration files if it is a copy of a selected one.

A description of the files created for a KNX protocol based project can be found in section *Files* in this document.

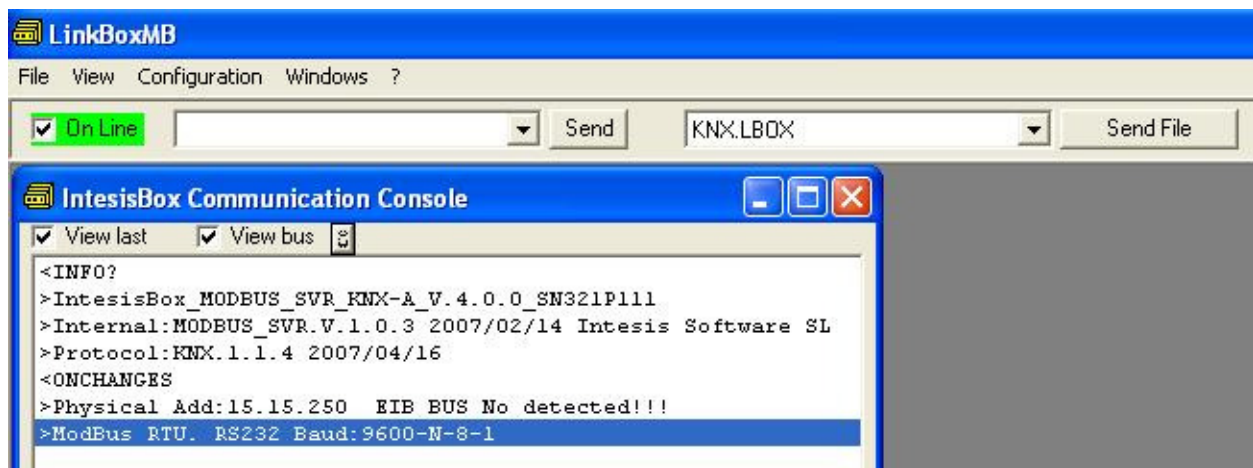
From all the possibilities of LinkBoxMB, only changes in configuration for the integration and configuration file generation can be performed while disconnected from IntesisBox (working off-line), allowing you to do these tasks in the office more comfortably. Before any monitoring or downloading action to IntesisBox can be performed, the connection between IntesisBox and the PC running LinkBoxMB must be established (working on-line). To do so follow these steps:

1. Make sure IntesisBox is powered-up and correctly connected to the Modbus system via the Ethernet connection (Modbus TCP) or serial connection (Modbus RTU) and to the KNX system via the EIB port (consult details for connection and pin assignments in section *Connections* of this document).
2. Connect a free PC serial port to the IntesisBox serial port marked as *PC Console*. (Use the standard serial cable supplied with the device or a customer's cable following the pin assignments specified in section *Connections* in this document).
3. Select in LinkBoxMB the PC serial port used for the connection to IntesisBox. Use menu Configuration -> Connection.



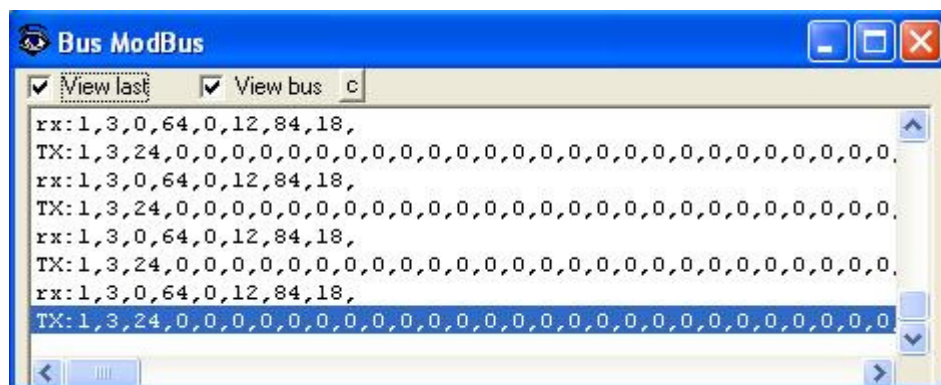


4. Check the checkbox *off-line* under the menu bar (it will change automatically to *on-line*) and LinkBoxMB will ask for INFO about the IntesisBox connected to it via the serial connection, if the connection is ok then IntesisBox will respond with its identification (this can be monitored in the *IntesisBox Communication Console* window, as showed below).



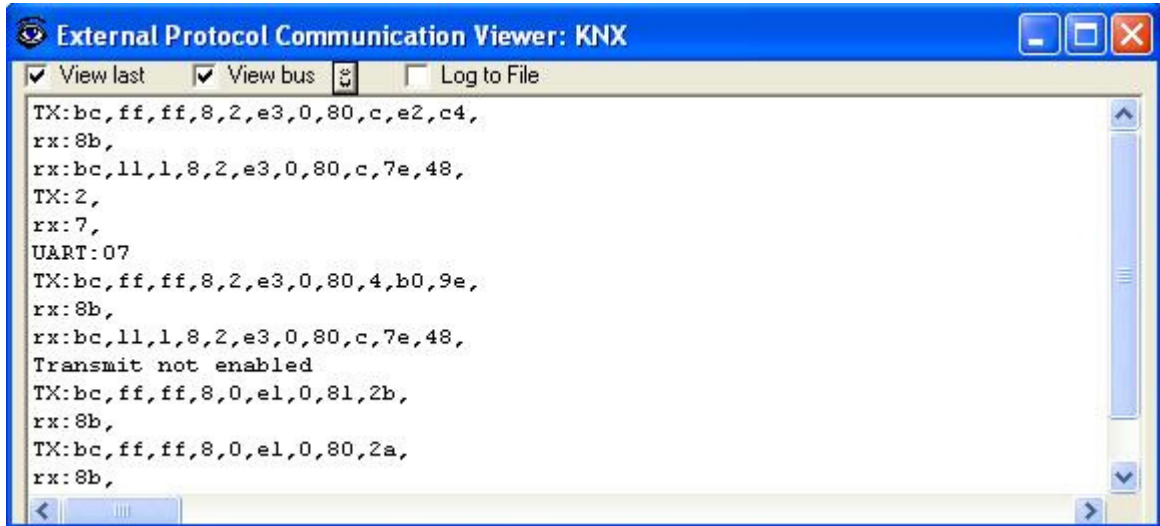
Once connected to IntesisBox, all the options of LinkBoxMB are fully operative.

To monitor the communication between IntesisBox and the Modbus master device, select the menu *View -> Bus -> Modbus*. The *Modbus communication Viewer* window will be opened. This window show in real time all the communication frames between IntesisBox and the Modbus master device as well as debugging messages referent to internal protocol (Modbus) sent by IntesisBox.





To monitor the communication between IntesisBox and the external system (KNX in this case), select the menu *View -> Bus -> KNX*. The *External protocol communication viewer* window will be opened. This window show in real time all the communication frames between IntesisBox and KNX devices as well as debugging messages referent to external protocol (KNX) sent by IntesisBox.



### 4.3 Connections configuration

To configure the IntesisBox's connection parameters and the signals list, select menu *Configuration -> IntesisBox*. The *KNX Configuration* window will be opened.

Select the Connection tab to configure the connection parameters.

Two kinds of information are configured using this window, the referent to the Modbus interface and the referent to the Mitsubishi Electric G50 interface.

Modbus interface configuration parameters:

1. Select the type of Modbus communication to use (TCP or RTU).

2. Enter the IP address for IntesisBox.

3. Enter the IP netmask for IntesisBox.

4. Enter the default router address for IntesisBox, leave blank if there is no need of router.

5. Enter the TCP port to use, by default 502.

6. Select the connection used (RS232 or RS485).

7. Select the baudrate.

8. Enter the Modbus slave number for IntesisBox.

#### Modbus Interface Configuration

1. Select the type of Modbus communication to use (TCP or RTU).

If ModBus TCP is selected, then:

2. Enter the IP address for IntesisBox.
3. Enter the IP netmask for IntesisBox.
4. Enter the default router address for IntesisBox, leave blank if there is no need of router.
5. Enter the TCP port to use, by default 502.

If ModBus RTU is selected, then:

6. Select the connection used (RS232 or RS485).
7. Select the baudrate.
8. Enter the Modbus slave number for IntesisBox.

KNX interface configuration parameters:

## KNX Interface Configuration

1. Physical address for IntesisBox.
2. Check this if you want IntesisBox to update the signals configured as "U" or "U2" after a KNX bus reset. Consult details about configuring signals as "U" and "U2" below in this document.
3. Delay in seconds to wait to perform the updates after a KNX bus reset.
4. Select the IntesisBox model used.

There are two models of IntesisBox supporting different number of points. You can identify the model of IntesisBox by the **order code** printed in the front label:

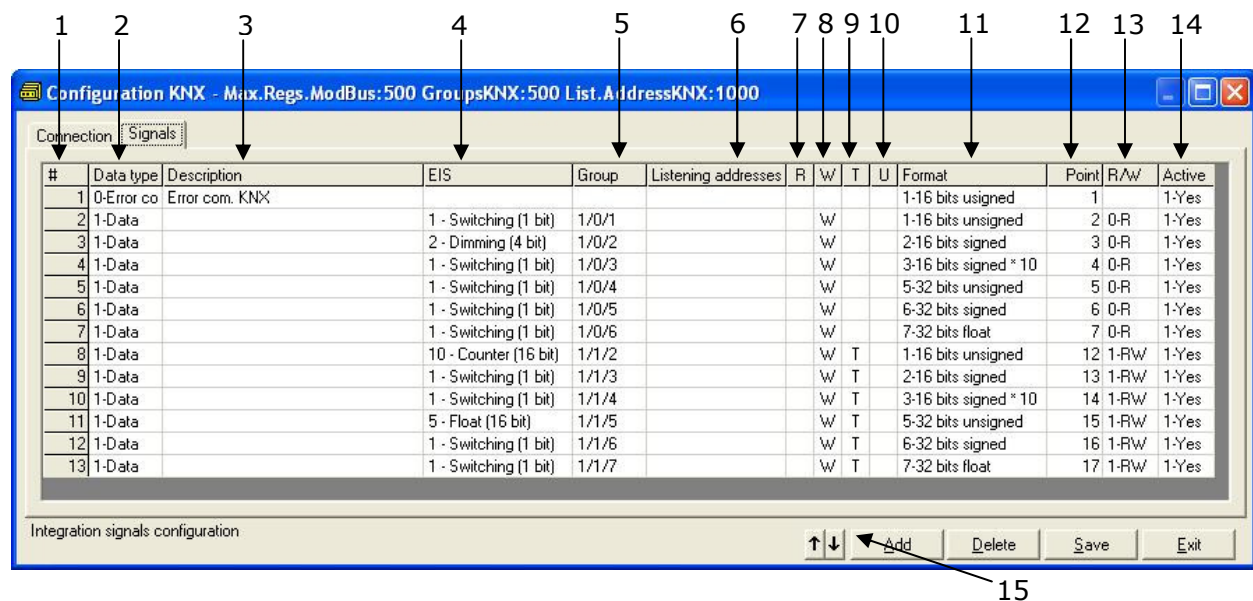
- **IBOX-MBS-KNX-100.** Tiny model supporting up to 100 points.
- **IBOX-MBS-KNX-A.** Basic model supporting up to 500 points.
- **IBOX-MBS-KNX-B.** Extended model supporting up to 3000 points.

You can identify also the model of your IntesisBox through the identification given by it in response to an INFO command, it is something like this:

IntesisBox\_MODBUS\_SVR\_KNX-**100**... -> this is the tiny model (up to 100 internal points)  
 IntesisBox\_MODBUS\_SVR\_KNX-**A**... -> this is the basic model (up to 500 internal points)  
 IntesisBox\_MODBUS\_SVR\_KNX-**B**... -> this is the extended model (up to 3000 internal points)

## 4.4 Signals list

Select the Signals tab to configure the signals list (the IntesisBox's internal points).



Signals list

1. **#.** Signal's number (edit not permitted). Every row in the grid corresponds to a signal (point). Signals (rows in the grid) can be added or deleted selecting the desired row and clicking *Add* or *Delete* buttons. Deletion action can be executed for a single row or even for some consecutive rows, all the rows selected will be deleted. This column is used only to enumerate the rows in the grid (signals).
2. **Data type.** Type of signal. The different type permitted are: *Communication Error* to indicate to the Modbus side a communication error with the KNX system, or *Data* for normal signals. Edit not permitted.
3. **Description.** Signal's description (optional). Used to describe the signal at user level.
4. **EIS.** KNX data type to encode this signal's value. Edit using the mouse right-button-click menu available on the column, as showed in the figure below, and select one of the possible values.

- 1 - Switching (1 bit)
- 2 - Dimming (4 bit)
- 3 - Time (24 bit)
- 4 - Date (24 bit)
- 5 - Float (16 bit)
- 6 - Scaling (8 bit)
- 7 - Drive Control (1 bit)
- 8 - Priority (2 bit)
- 9 - Float IEEE (32 bit)
- 10 - Counter (16 bit)
- 11 - Counter (32 bit)
- 12 - Access (32 bit)
- 13 - ASCII char (8 bit)
- 14 - Counter (8 bit)
- 15 - String (14 bytes)

5. *Group*. Main EIB group address for the signal. Format: P/I/S or P/S. Features W,R,T,U explained below will only apply for this main EIB group address, not for listening addresses (if defined).
6. *Listening Addresses*. EIB group addresses that will be listen by IntesisBox for this signal, that is to say, if the gateway receives an EIB telegram with destination one of these listening addresses, then the telegram will be taken into account and the corresponding action will be performed on this signal. Format: P/I/S or P/S, if more than one is entered then they must be separated by comma.
7. *R*. Indicates if this signal is allowed to be read from KNX system. Possible values: "R" or blank. "R" means feature activated. Edit using the mouse right-button-click pop-up menu available on the column. Freely configurable with some necessary restrictions (see below).
8. *W*. Indicates if this signal is allowed to be written from KNX system. Possible values: "W" or blank. "W" means feature activated. Edit using the mouse right-button-click pop-up menu available on the column. Freely configurable with some necessary restrictions (see below).
9. *T*. Indicates if this signal will generate a telegram sending to the KNX system following a change of the signal's value, that is to say, any change of value of this signal will be transmitted to the KNX system if this feature is activated. Possible values: "T" or blank. "T" means feature activated. Edit using the mouse right-button-click pop-up menu available on the column. Freely configurable with some necessary restrictions (see below).
10. *U*. Indicates if this signal will be updated whenever the gateway starts up or after an EIB bus reset. "U" means feature activated for the main EIB group address (a read of the main EIB group address will be performed in the KNX system for the update), "U2" means feature activated for the first listening address (a read of the first listening address defined will be performed in the KNX system for the update). Blank means feature not activated. Edit using the mouse right-button-click pop-up menu available on the column. Freely configurable with some necessary restrictions (see below).
11. *Format*. Modbus data format to encode this signal's value. Edit using the mouse right-button-click menu available on the column, as showed in the figure below, and select one of the possible values.

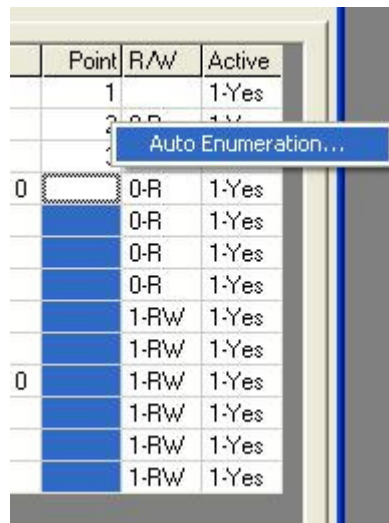
1-16 bits unsigned
2-16 bits signed
3-16 bits signed * 10
5-32 bits unsigned
6-32 bits signed
7-32 bits float

12. *Point*. Modbus register address for the point. **Note that every address entered here corresponds to a 16 bits register, if you select a format of 32 bits for the point, then it takes two consecutive addresses in the address map, this means that, for example, if you have one point with address 1 and a format of 32 bits float, then address 2 can not be used for any other point, the subsequent free address to use will be 3.**

You can enter directly the address desired individually in every row or auto enumerate for some consecutive rows, for this last proceed as follow.

- Select using the left mouse button (clicking and dragging) the *Point* field of all the rows in the list to which you want to automatically assign addresses (must be consecutive rows).

- Click right mouse button over the selected fields and select *Auto Enumeration* option from the pop-up menu that will appear.



13. *R/W*. Signal type (from Modbus system point of view). Edit using the mouse right-button-click menu available on the column and select one of the possible values. Possible values are *R* for read only signals or *R/W* for Read/write signals or *W* for only Write signals. A selection in this column will affect the KNX flags for the signal, that will be pre-set to predefined values for the type of signal selected here (some necessary restrictions on KNX flags are necessary depending on the signal type, see below). In case of *W* only Write, really you will can read from ModBus but this signal not is write enabled from EIB.
14. *Active*. Indicates if the signal is active or not for the integration. Possible values: 0-No, 1-Yes. Edit using the mouse right-button-click menu available on the column.
15. Buttons to move the selected row (or rows) up or down inside the grid. To move up or down inside the grid a single row or a group of consecutive rows, just select the row or rows using the left button of the mouse and push the desired up or down button. (This can be done also using the key combinations *ALT+arrow up* or *ALT+arrow down* instead of up or down buttons).

All the mentioned flags (*R,W,T,U,U2*) related to the KNX part are freely configurable for every point in the gateway, with the following necessary restrictions:

- For signals of type *R* (read only), KNX flags *R* & *T* are not allowed, flag *W* is mandatory (activated automatically) and flags *U* & *U2* are optional.
- For signals of type *R/W* (read/write), flags *W* & *T* flags are mandatory (activated automatically), and flags *R*, *U* and *U2* are optional.
- It is not possible to activate simultaneously KNX flags *R* & *U*, in return *R* & *U2* can be used simultaneously.
- When flag *U* is activated, it is necessary to deactivate *R* (it is done automatically).

**NOTE that philosophy of *U* flag in IntesisBox is not the same as in other general KNX equipment.**

## 4.5 Sending the configuration to IntesisBox

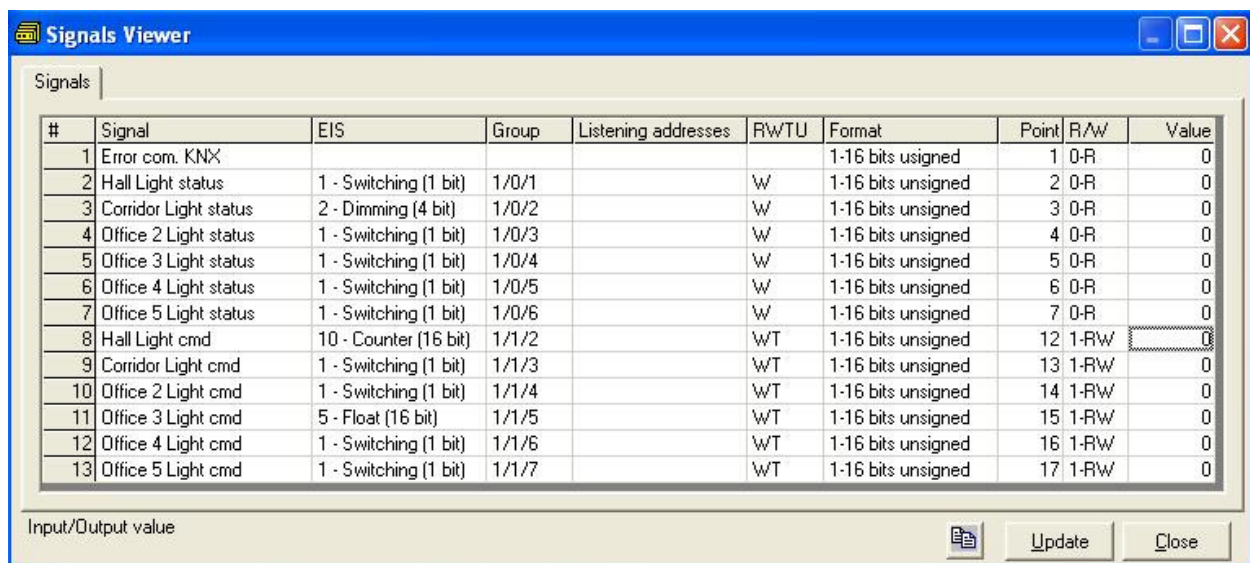
When the configuration has been saved (button *Accept*) and the IntesisBox configuration binary file has been generated (remember to select yes when asked if you want to generate the IntesisBox file), to send the configuration file to IntesisBox click on the button **Send File**. The process of file transmission can be monitored in the *IntesisBox Communication Console* window. If the file transmission is ok, IntesisBox will reboot automatically with the new configuration loaded.

Remember that saving the configuration and generating the IntesisBox file only saves to the hard disk on the PC the configuration files. **Do not forget to send the configuration file to the IntesisBox using button *Send File*.**



## 4.6 Signals viewer

Once IntesisBox is running with the correct configuration, to supervise the status of the configured signals, select menu *View -> Signals*. The Signals Viewer window will be opened. This window shows all the active IntesisBox's signals with its main configuration parameters and its real time value in the column Value. After a reset of IntesisBox or after sending a configuration file to the IntesisBox, all the signal's values will be updated automatically in the signals viewer, in case you connect to the IntesisBox when it is already running, you should press the *Update* button to get updated values, press just once the button to update all the signals values, since that moment the signal values will be maintained updated until the connection is closed.



The Signals Viewer window displays a table of signals with the following columns: #, Signal, EIS, Group, Listening addresses, RWTU, Format, Point, R/W, and Value. The table lists 13 signals, including error messages and light status/commands for various rooms. The 'Value' column shows the current value for each signal, with some cells being editable (indicated by a small box around the value).

#	Signal	EIS	Group	Listening addresses	RWTU	Format	Point	R/W	Value
1	Error com. KNX					1-16 bits unsigned	1	0-R	0
2	Hall Light status	1 - Switching (1 bit)	1/0/1		W	1-16 bits unsigned	2	0-R	0
3	Corridor Light status	2 - Dimming (4 bit)	1/0/2		W	1-16 bits unsigned	3	0-R	0
4	Office 2 Light status	1 - Switching (1 bit)	1/0/3		W	1-16 bits unsigned	4	0-R	0
5	Office 3 Light status	1 - Switching (1 bit)	1/0/4		W	1-16 bits unsigned	5	0-R	0
6	Office 4 Light status	1 - Switching (1 bit)	1/0/5		W	1-16 bits unsigned	6	0-R	0
7	Office 5 Light status	1 - Switching (1 bit)	1/0/6		W	1-16 bits unsigned	7	0-R	0
8	Hall Light cmd	10 - Counter (16 bit)	1/1/2		WT	1-16 bits unsigned	12	1-RW	0
9	Corridor Light cmd	1 - Switching (1 bit)	1/1/3		WT	1-16 bits unsigned	13	1-RW	0
10	Office 2 Light cmd	1 - Switching (1 bit)	1/1/4		WT	1-16 bits unsigned	14	1-RW	0
11	Office 3 Light cmd	5 - Float (16 bit)	1/1/5		WT	1-16 bits unsigned	15	1-RW	0
12	Office 4 Light cmd	1 - Switching (1 bit)	1/1/6		WT	1-16 bits unsigned	16	1-RW	0
13	Office 5 Light cmd	1 - Switching (1 bit)	1/1/7		WT	1-16 bits unsigned	17	1-RW	0

At the bottom of the window, there is a section for 'Input/Output value' with an 'Update' button and a 'Close' button.

The signals viewer can be used although only one system is connected to the IntesisBox, *Modbus* or *KNX*, and is very useful for supervision and test.

It is possible to force a specific value to any signal for test purposes, to do so just double click on the row and select the desired value and Accept in the Data Test window. If the signal is of type R or RW, then the value entered will be available to be read from Modbus master device, if the signal is of type RW, then the value entered will be sent to the KNX system.



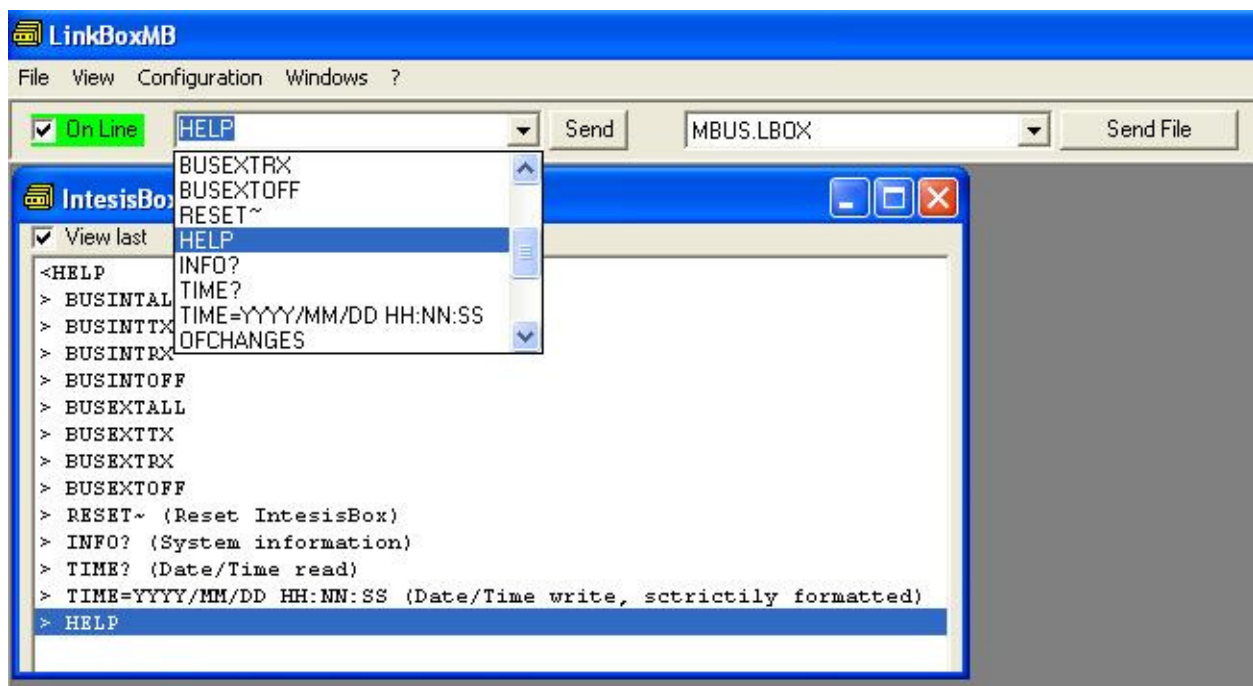
The 'Hall Light cmd' Data Test window shows a 'Test Data' field with a value of 0. Below the field are 'Accept' and 'Cancel' buttons.

This tool is very useful to test any of the systems connected to IntesisBox, *Modbus* and *KNX* without the need to actuate on the real signals.

The signals viewer window has a button to copy to the Windows Clipboard all the contents of the window (in tab separated text format).

## 4.7 System commands

LinkBoxMB includes an option to send to IntesisBox a set of system commands for debugging and control purposes; this list is available in the commands list as shown in the figure below. To send a command to IntesisBox just select it from the list, or type it with the correct format, and press *Enter* or click on button *Send*. IntesisBox will act accordingly with the command received; the process can be monitored in the IntesisBox Communication Console window. The use of some of these commands can be critical for IntesisBox normal functioning, having this in mind use only these commands following the recommendations of Intesis Software technical support. A list of the more commonly used commands and the way to use them will be returned by IntesisBox after sending the command *HELP*.



## 4.8 Files

LinkBoxMB saves the integration configuration in the following files inside the project folder:

PROJECT.INI	Ini file containing general information referent to the project
KNX.INI	Ini file containing the information referent to the connection window and other special adjustments
KNX.DAT	Text file (tab separated values) with the signals information (signals list). This file can be edited (with Excel for example) to change the configuration quicker and easier. Later on, when selecting <i>Configuration</i> -> <i>IntesisBox</i> in LinkBoxMB, if the changes have been made respecting the correct format, all the changes in the configuration done from Excel can be seen in the signals list.
KNX.LBOX	Binary file created from the information in the files described above. This is the file uploaded to the gateway.

It is strongly recommended to back up the project folder containing these files in external media, once the installation process is finished. This way you will be able to do future configuration changes in case of reinstallation of LinkBoxMB due, for example, to a failure of the hard disk in the PC where it was previously installed.

***The configuration cannot be downloaded from the gateway to LinkBoxMB, only can be uploaded; the upload file KNX.LBOX does not contain all the integration information, as for example the signals description.***

## 4.9 Functionality considerations

IntesisBox returns some useful information about internal parameters in response to an INFO command:

Referent to IntesisBox:

- Firmware version and serial number.
- Protocols versions.

Referent to KNX side:

- Physical address configured.
- EIB bus status detected.

Referent to Modbus TCP:

- IP address configured.
- NetMask configured.
- Default Gateway configured.
- Port configured.

Referent to Modbus RTU:

- Connection type.
- Serial port settings.

\* See *Release notes* of the latest firmware version for up to date information on IntesisBox-Modbus Server KNX gateway and LinkBoxMB functionality.

## 5. Setup process and troubleshooting

### 5.1 Pre-requisites

It is necessary to have the Modbus master device operative and well connected to the Modbus port of IntesisBox, remember to respect the maximum of 15 meters cable distance if using RS232 communication.

It is necessary to have a KNX TP-1 (EIB) system operative and ready to be connected to the EIB port of IntesisBox.

Connectors, connection cables, PC for LinkBoxMB, and other auxiliary material, if needed, are not supplied by Intesis Software for this standard integration. The items supplied by Intesis Software for this integration are:

- IntesisBox-Modbus Server device with KNX external protocol firmware loaded.
- LinkBoxMB software to configure IntesisBox.
- Console cable needed to download the configuration to IntesisBox.
- Product documentation.

If requested, Intesis Software also can supply:

- Standard plug-in power supply 220Vac 50Hz to power IntesisBox (European plug type).

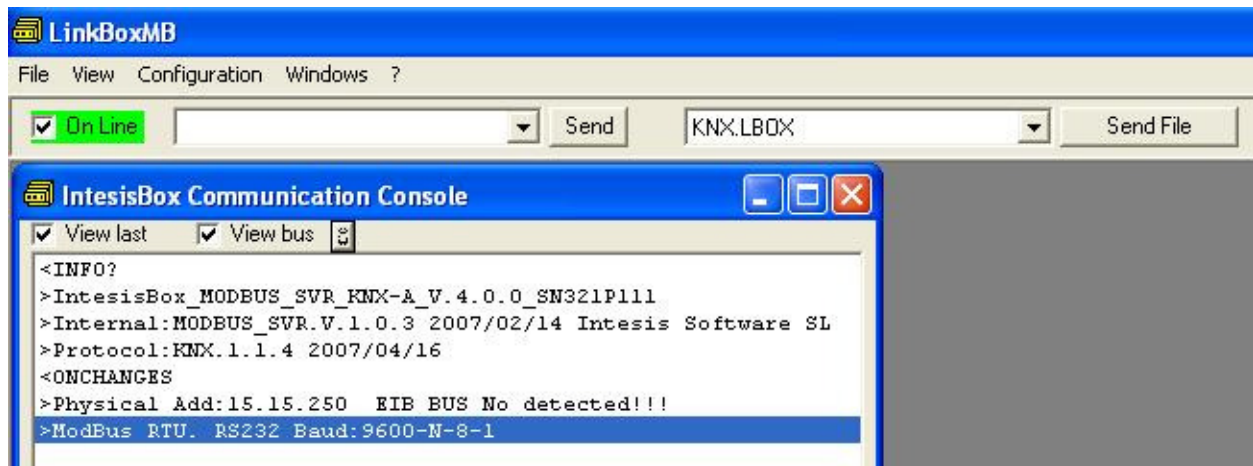
### 5.2 Setup procedure

1. Install LinkBoxMB on your laptop, use the setup program supplied for this and follow the instructions given by the Installation wizard.
2. Install IntesisBox in the desired installation site. The mounting can be on DIN rail or on a stable not vibrating surface (DIN rail mounted inside a metallic industrial cabinet connected to ground is recommended).
3. Connect the communication cable coming from the Modbus master device to the port marked as **Modbus** of IntesisBox (used either RS232, RS485 or Ethernet port depending on the type of Modbus communication to use). (See details for this communication cable in section *Connections* of this document).
4. Connect the EIB Bus cable to the port marked as **KNX** of IntesisBox. (See details for this communication cable in section *Connections* of this document).
5. Power up IntesisBox. The supply voltage can be 9 to 30 Vdc or just 24 Vac. You can use also the standard plug-in power supply 220/125VAC-12VDC/300mA supplied with the device (if requested). Take care of the polarity of the supply voltage applied.

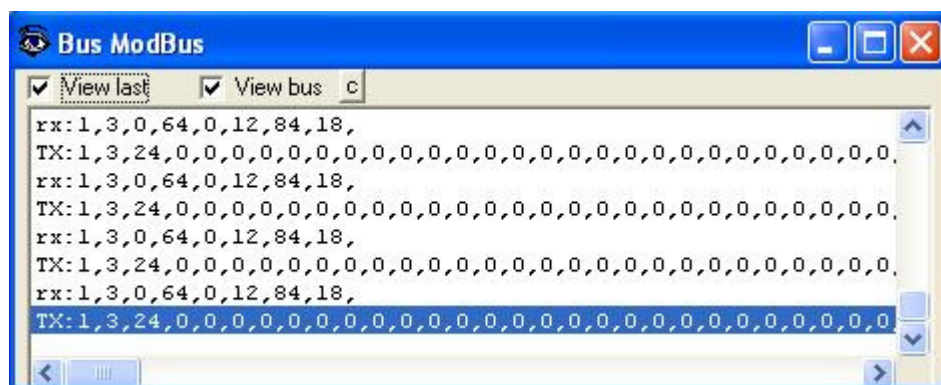
**WARNING!** In order to avoid earth loops that can damage IntesisBox and/or any other equipment connected to it, we strongly recommend:

- The use of DC power supplies, floating or with the negative terminal connected to earth. **Never use a DC power supply with the positive terminal connected to earth.**
- The use of AC power supplies only if they are floating and not powering any other device.

6. Connect the communication cable coming from the serial port of your laptop PC to the port marked as **PC Console** of IntesisBox. (See details for this communication cable in section *Connections* of this document).
7. Open LinkBoxMB, create a new project selecting a copy of the one named **DEMO KNX** and give it the name desired, select the serial port used to connect to IntesisBox (menu Configuration -> Connection) and switch working mode to *on-line* (checkbox *off-line/on-line*). The IntesisBox identification must appear in the *IntesisBox communication console* window as showed below.

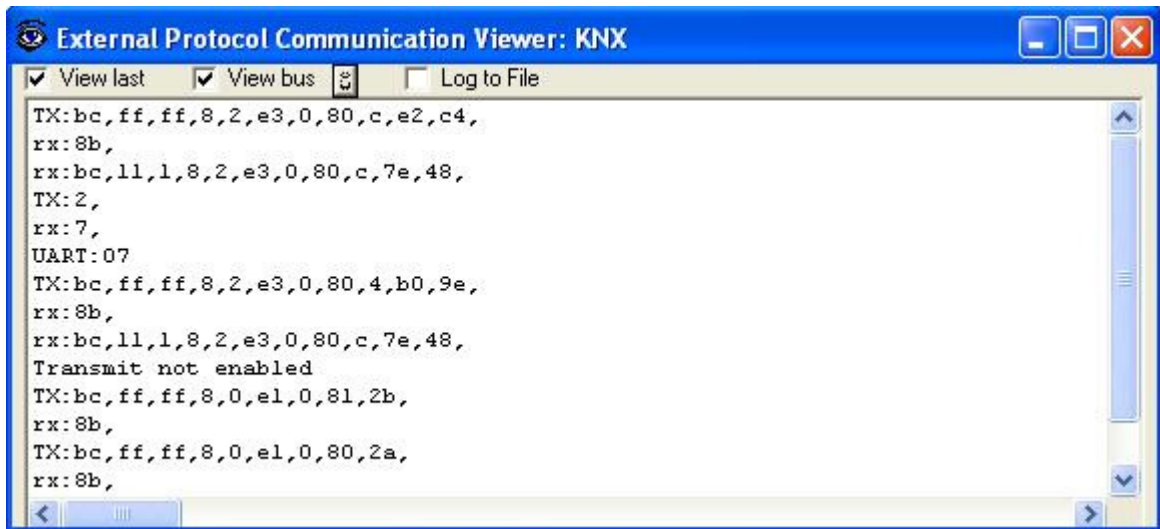


8. Modify the configuration as desired, save it and download the configuration file to IntesisBox as explained before.
9. Open the *Modbus Communication Viewer* window (menu View -> Bus -> Modbus) and check that there is communication activity, some TX frames and some other rx frames. This means that the communication with the Modbus master device is ok. In case there is no communication activity between IntesisBox and the Modbus master device check that it is operative, check the baud rate, and check also the communication cable used to connect both devices. (See details for this communication cable in section *Connections* of this document).



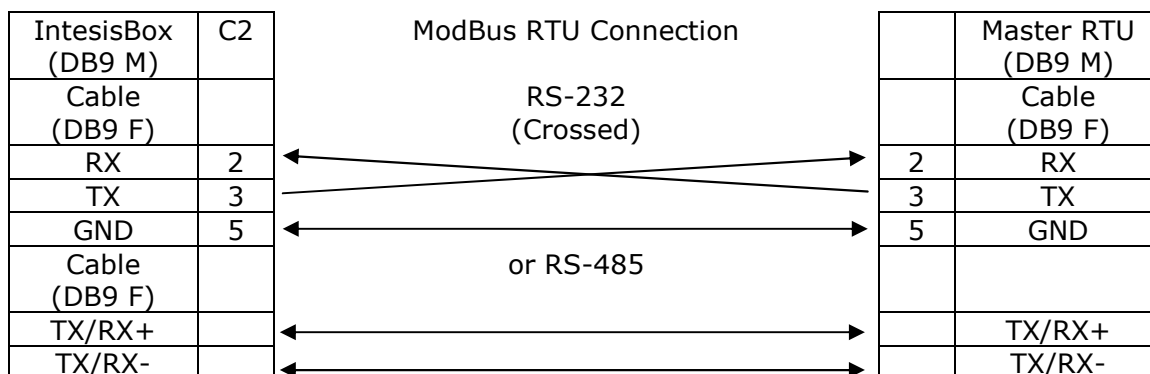
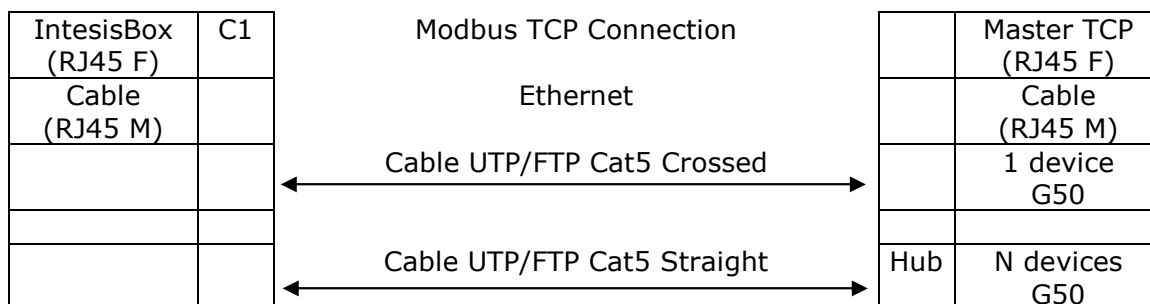
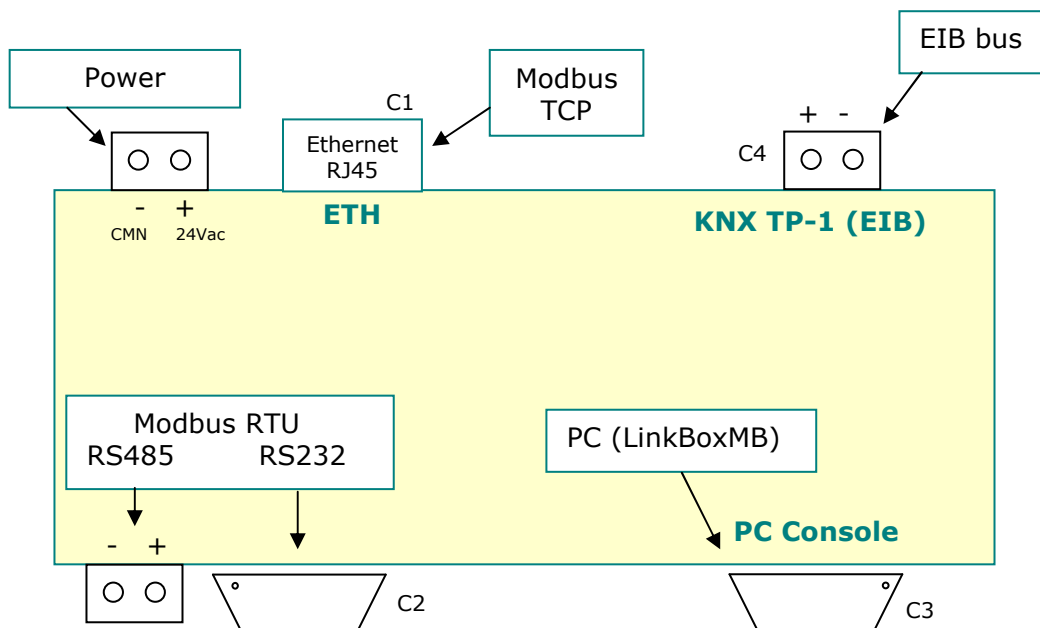
10. Open the *External Protocol Communication Viewer* window (menu View -> Bus -> KNX) and check that there is communication activity, some TX frames and some other rx frames as showed in the figure below. This means that the communication with the KNX

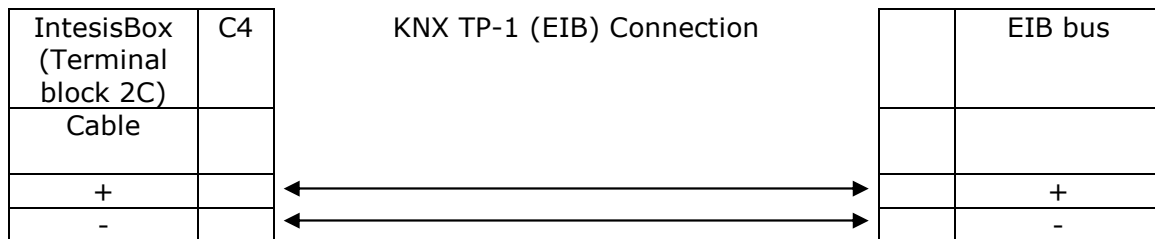
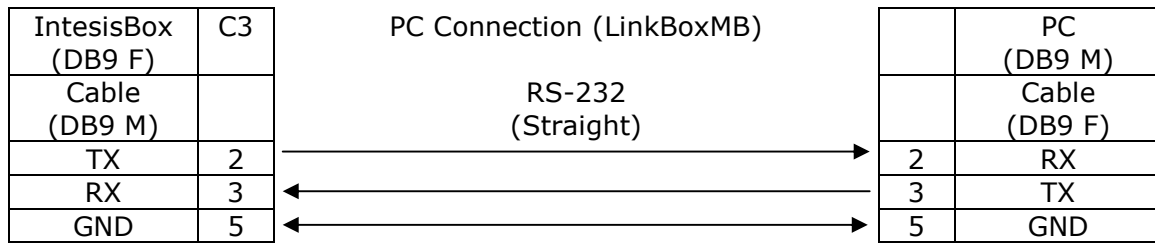
system is ok. In case there is no communication activity between IntesisBox and the KNX system check that EIB bus is operative and well connected to the IntesisBox.





## 6. Connections







## 7. Mechanical & Electrical characteristics.

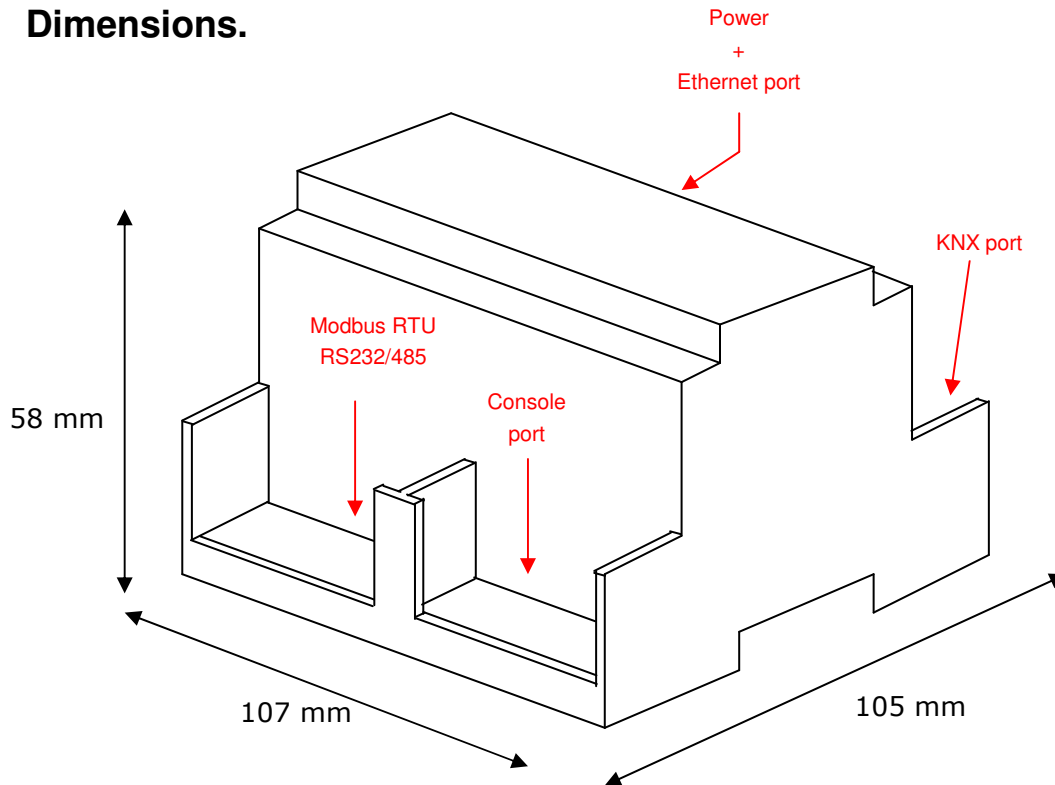


Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Colour	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10% 1.4W. 24Vac +/-10% 1.4VA. Plug-in terminal block for power connection (2 poles).
Mounting	Surface. Wall. DIN rail EN60715 TH35.
Modbus RTU ports	1 x Serial RS232 (DB9 male DTE). 1 x Serial RS485 (Plug-in screw terminal block 2 poles).
Modbus TCP port	1 x Ethernet 10BT RJ45.
KNX port	1 x KNX TP1 (EIB) port opto-isolated. Plug-in terminal bloc (2 poles).
LED indicators	1 x Power. 2 x KNX port activity (Tx, Rx). 2 x Serial port (Modbus RTU) activity (Tx, Rx). 2 x Ethernet port (Modbus TCP) link and activity (LNK, ACT). 1 x KNX programming/bus. <sup>1</sup>
Push buttons	1 x KNX programming. <sup>1</sup>
Console port	RS232. DB9 female connector (DCE).
Configuration	Via console port. <sup>2</sup>
Firmware	Allows upgrades via console port.
Operational temperature	-40°C to +70°C
Operational humidity	5% to 95%, non condensing
Protection	IP20 (IEC60529).
Certifications	CE
RoHS conformity	Compliant with RoHS directive (2002/95/CE).

<sup>1</sup> Not operational for the moment. Reserved for future use.

<sup>2</sup> Standard cable DB9male-DB9female 1,8 meters long is supplied with the device for connection to a PC COM port for configuring and monitoring the device. The configuration software, compatible with Windows® operating systems, is also supplied.

## 8. Dimensions.



Recommended available space for its installation into a cabinet (wall or DIN rail mounting), with space enough for external connections:

